MATHEMATICS STANDARD ARTICULATED BY GRADE LEVEL

GRADE 6

Strand 1: Number Sense and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Express fractions as ratios, comparing two whole numbers (e.g., ¾ is equivalent to 3:4 and 3 to 4).

PO 2. Compare two proper fractions, improper fractions, or mixed numbers.

PO 3. Order three or more proper fractions, improper fractions, or mixed numbers.

PO 4. Determine the equivalency between and among fractions, decimals, and percents in contextual situations.

PO 5. Identify the greatest common factor for two whole numbers.

PO 6. Determine the least common multiple for two whole numbers.

PO 7. Express a whole number as a product of its prime factors, using exponents when appropriate.

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

PO 1. Select the grade-level appropriate operation to solve word problems.

PO 2. Solve word problems using grade-level appropriate operations and numbers.

PO 3. Apply grade-level appropriate properties to assist in computation.

PO 4. Apply the symbols for "…" or "‾‾" to represent repeating decimals and ":" to represent ratios, superscripts as exponents.

PO 5. Use grade-level appropriate mathematical terminology.

PO 6. Simplify fractions to lowest terms.

PO 7. Add or subtract proper fractions and mixed numbers with unlike denominators with regrouping.

PO 8. Demonstrate the process of multiplication of proper fractions using models.

PO 9. Multiply proper fractions.

PO 10. Multiply mixed numbers.

PO 11. Demonstrate that division is the inverse of multiplication of proper fractions.

PO 12. Divide proper fractions.

PO 13. Divide mixed numbers.

PO 14. Solve problems involving fractions or decimals (including money) in contextual situations.

PO 15. Simplify numerical expressions using the order of operations with grade-appropriate operations on number sets.

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

PO 1. Solve grade-level appropriate problems using estimation.

PO 2. Use estimation to verify the reasonableness of a calculation (e.g., Is 5/9 x 3/7 more than 1?).

PO 3. Round to estimate quantities in contextual situations (e.g., round up or round down).

PO 4. Estimate and measure for the area and perimeter of polygons using a grid.

PO 5. Verify the reasonableness of estimates made from calculator results within a contextual situation.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

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Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

PO 2. Construct a histogram, line graph, scatter plot, or stem-and-leaf plot with appropriate labels and title from organized data.

PO 3. Interpret simple displays of data including double bar graphs, tally charts, frequency tables, circle graphs, and line graphs.

PO 4. Answer questions based on simple displays of data including double bar graphs, tally charts, frequency tables, circle graphs, and line graphs.

PO 5. Find the mean, median (odd number of data points), mode, range, and extreme values of a given numerical data set.

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PO 6. Identify a trend (variable increasing, decreasing, remaining constant) from displayed data.

PO 7. Compare trends in data related to the same investigation.

PO 8. Solve contextual problems using bar graphs, tally charts, and frequency tables.

Concept 2: Probability

Understand and apply the basic concepts of probability.

PO 1. Name the possible outcomes for a probability experiment.

PO 2. Express probabilities of a single event as a decimal.

PO 3. Predict the outcome of a grade-level appropriate probability experiment.

PO 4. Record the data from performing a grade-level appropriate probability experiment.

PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.

PO 6. Make predictions from the results of student-generated experiments using objects (e.g., coins, spinners, number cubes, cards).

PO 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment.

Concept 3: Discrete Mathematics – Systematic Listing and Counting

Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Determine all possible outcomes involving a combination of three sets of three items, using a systematic approach (e.g., 3 different shirts, 3 different pairs of pants, and 3 different belts).

PO 2. Determine all possible arrangements given a set with four or fewer objects using a systematic list, table or tree diagram when order is not important.

Concept 4: Vertex-Edge Graphs

Understand and apply vertex-edge graphs.

PO 1. Find the shortest route on a map from one site to another (vertex-edge graph).

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Strand 3: Patterns, Algebra, and Functions

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Concept 1: Patterns

Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate recursive pattern, using symbols or numbers.

PO 2. Extend a grade-level appropriate iterative pattern.

PO 3. Solve grade-level appropriate iterative pattern problems.

Concept 2: Functions and Relationships

Describe and model functions and their relationships.

PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model).

Concept 3: Algebraic Representations

Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Evaluate expressions involving the four basic operations by substituting given fractions for the variable (e.g., n+3, when n= ½).

PO 2. Use variables in contextual situations.

PO 3. Translate a written phrase to an algebraic expression (e.g., The quotient of m and 5 is $\frac{m}{5} or\ m \div 5$.).

PO 4. Translate a phrase written in context into an algebraic expression (e.g., Write an expression to describe the situation: John has x pieces of candy and buys three more. x + 3).

PO 5. Solve one-step equations with one variable represented by a letter or symbol, using inverse operations with whole numbers.

Concept 4: Analysis of Change

Analyze change in a variable over time and in various contexts.

PO 1. Identify values on a given line graph or scatter plot (e.g., Given a line showing wages earned per hour, what is the wage at five hours?).

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Strand 4: Geometry and Measurement

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Concept 1: Geometric Properties

Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Classify polygons by their attributes (e.g., number of sides, length of sides, angles, parallelism, perpendicularity).

PO 2. Draw a geometric figure showing specified properties, such as parallelism and perpendicularity.

PO 3. Classify prisms, pyramids, cones, and cylinders by base shape and lateral surface shape.

PO 4. Classify 3-dimensional figures by their attributes.

PO 5. Compare attributes of 2-dimensional figures with 3-dimensional figures.

PO 6. Draw triangles with appropriate labels.

PO 7. Identify supplementary or complementary angles.

PO 8. Identify the diameter, radius, and circumference of a circle or sphere.

PO 9. Draw a 2-dimensional shape with a given number of lines of symmetry.

Concept 2: Transformation of Shapes

Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Identify reflections and translations using pictures.

PO 2. Perform elementary transformations to create a tessellation.

Concept 3: Coordinate Geometry

Specify and describe spatial relationships using coordinate geometry and other representational systems.

PO 1. Graph a polygon in the first quadrant using ordered pairs.

PO 2. State the missing coordinate of a given figure in the first quadrant of a coordinate grid using geometric properties (e.g., Find the coordinates of the missing vertex of a rectangle when two adjacent sides are drawn.).

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Concept 4: Measurement - Units of Measure - Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.
PO 1. Determine the appropriate measure of accuracy within a system for a given contextual situation (e.g., Would you measure the length of your bedroom wall using inches or feet?).
PO 2. Determine the appropriate tool needed to measure to the needed accuracy.
PO 3. Determine a linear measurement to the appropriate degree of accuracy.
PO 4. Measure angles using a protractor.
PO 5. Convert within a single measurement system (U.S. customary or metric) (e.g., How many ounces are equivalent to 2 pounds?).
PO 6. Solve problems involving the perimeter of polygons.
PO 7. Determine the area of triangles.
PO 8. Distinguish between perimeter and area in contextual situation.
PO 9. Solve problems for the areas of parallelograms (includes rectangles).
PO 10. Identify parallelograms having the same perimeter or area.
PO 11. Determine the actual measure of objects using a scale drawing or map.

Strand 5: Structure and Logic

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Concept 1: Algorithms and Algorithmic Thinking
Use reasoning to solve mathematical problems in contextual situations.
PO 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem.
PO 2. Analyze algorithms for computing with decimals.

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof
Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.
PO 1. Solve a simple logic problem from given information (e.g., Which of three different people live in which of three different colored houses?).